AMBOSOL® SYNTHETIC MAGNESIUM SILICATE IS AN EXCELLENT ADSORBENT FOR USE IN THE PURIFICATION OF POLYOLS, WHICH ARE COMMONLY USED IN THE PRODUCTION OF URETHANE POLYMERS. AMBOSOL® ADSORSBS SODIUM OR POTASSIUM HYDROXIDES LEFT BEHIND FROM THE POLYOL MANUFACTURING PROCESS THAT WOULD BE DETRIMENTAL TO THE POLYURETHANE MANUFACTURING PROCESS. AMBOSOL® COMBINES HIGH ADSORPTION ACTIVITY WITH EXCELLENT FILTERABILITY. IN ADDITION, WORLD-CLASS TECHNICAL SUPPORT IS OFFERED TO OUR CUSTOMERS BY PQ CORPORATION.

PRODUCT

AMBOSOL®
AMBOSOL® is a hydrated synthetic, amorphous magnesium silicate in the form of a white, finely divided, free-flowing powder with a specific structure especially designed for polyol purification. The AMBOSOL® grades are insoluble in most aqueous and organic liquids.

AMBOSOL® PRODUCT RANGE
AMBOSOL® synthetic magnesium silicates are prepared by a precipitation process. Table 1 shows the main characteristics of the AMBOSOL® product range. The AMBOSOL® products have SiO₂/MgO molar ratio of 2.7 to 3.4 and differ in bulk density, particle size distribution (see Figure 1), and consequently filterability. The AMBOSOL® grades can be expressed by the following chemical definition: MgO – x SiO₂ – y H₂O

<table>
<thead>
<tr>
<th>Table 1</th>
<th>AMBOSOL® typical values</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Unit</td>
</tr>
<tr>
<td>Description</td>
<td>standard, all round</td>
</tr>
<tr>
<td>Appearance</td>
<td>White, odorless powder, insoluble in water</td>
</tr>
<tr>
<td>Magnesium Silicate (%)</td>
<td>75</td>
</tr>
<tr>
<td>Molar ratio</td>
<td>2.7</td>
</tr>
<tr>
<td>Loss on ignition (500°C) (%)</td>
<td>23</td>
</tr>
<tr>
<td>Water content (105°C) (%)</td>
<td>≤ 15</td>
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<tr>
<td>Adsorption KOH (mg/g)</td>
<td>≥ 180</td>
</tr>
<tr>
<td>Bulk density (untamped) (kg/m³)</td>
<td>400</td>
</tr>
<tr>
<td>D50 (µm)</td>
<td>17</td>
</tr>
</tbody>
</table>

Figure 1 Particle size distribution

The adsorption activity (expressed in mg KOH per g of adsorbent) and filtration performance is determined with a comparative laboratory test carried out on di-propylene-glycol (DPG) according to a method currently used by polyol manufactures. The results can vary according to the nature of polyols and process conditions.
Polyol Purification
Various types of crude polyol products used in manufacturing polyurethane foams differ in molecular weight, viscosity, chemical composition, and residual catalyst level. The catalysts, which are typically alkali metal hydroxides or other metal salts, are typically present at 1700 to 4000 ppm in the crude polyol. Generally a concentration after treatment of below about 5 ppm is desired for polyurethane production.

It is known that catalyst removal by AMBOSOL® can be improved by addition of some water, typically at least 0.3% but as much as 5% based on the weight of polyol. However, the amount of water added may be limited by the ability of the process to remove it from the final product. Water is added to the blend of polyol and adsorbent prior to heating and filtration to achieve a target total water content, which is the sum of the initial water in the polyol, the free water in AMBOSOL® (determined by weight loss at 105°C), and the added water.

The required amount of AMBOSOL®, typically in the range of 1 to 3 wt%, strongly depends on the concentration of catalyst in the polyol. From an economical point of view, the optimum dosage of AMBOSOL® is best determined for a specific manufacturer’s polyol and process by varying temperature, contact time, and water content in controlled tests.

Parameters Influencing Adsorption
The main parameters that influence the adsorption of impurities from polyol by AMBOSOL® are:
- Type of polyol
- Type and amount of impurities
- Dosage
- Particle size distribution
- Temperature
- Contact time
- Water content

Figure 2  Dose-response curves
Figure 2 shows the dose-response curves for residual alkali [Na+K] by AMBOSOL® at a treatment temperature of 110°C from a typical crude polyol product. This figure shows that, for this particular polyol, a dosage of about 1.5 wt% AMBOSOL® is required to achieve a residual alkali [Na+K] content below 5 ppm.

Use of AMBOSOL® as an Adsorbent
Since polyol manufacturing differs in process and chemistry, each situation needs to be evaluated and optimized. The following recommendations should be followed to achieve optimum adsorption performance:
- Prevent air contact, especially if polyols are susceptible to oxidative degradation. Therefore, operate the process entirely under nitrogen.
- Remove un-reacted oxides, which may interfere with catalyst removal or react with free water to produce low molecular weight glycols.
- Treat the crude polyol at optimum water concentration, AMBOSOL® dosage, contact time and temperature. The optimum treatment temperature will vary with each process. In general, the higher the treatment temperature, the higher the catalyst removal efficiency.
- It is recommended to agitate the polyol throughout the adsorption cycle.
- Typically Ambosol is removed from the polyol by filtration in a plate and frame type filter press. The filtration speed is principally governed by the viscosity of the polyol at the filtration temperature. Although the particle size of Ambosol is
specifically controlled to enhance filtration, it is sometimes desirable to pre-coat the filter cloths with filter-aid.

**HSEQ AND PACKAGING**

**Health, Safety and Environment**
For detailed information see our MSDS.

**ISO 9001/14001**
PQ Corporation activities fulfill the requirements as described in the international standards ISO 9001 (quality) and ISO 14001 (Environment). Specific procedures are available at all levels within the company in order to ensure that our products meet customers’ and community requirements at all times. To ensure a high and consistent product quality, the Process & Quality Control Department plays a key role. AMBOSOL® grades are checked for e.g. solid content, KOH adsorption, particle size distribution, pH, and filtration performance.

**Packaging and storage**
The AMBOSOL® grades are available in bags and big bags. Bulk deliveries can be arranged on specific request. For detailed packaging information see our datasheets. The AMBOSOL® grades are stable during storage. However it is highly recommended to store the product in a dry place in their original packaging.

**Technical support**
Laboratory studies to optimize the dosages of AMBOSOL® in combination with the desired process conditions are a very effective tool to reduce production costs. PQ Corporation is able to offer technical support to the polyol industry, and has several programs to optimize adsorption performance relative to costs.

PQ Corporation’s capabilities include:
- Optimization of the adsorption recipe
- Optimization of the adsorption process conditions, i.e. temperature, water concentration, and contact time
- Optimization of the filtration process
- Statistical methods to rapidly develop optimized adsorption recipes and process conditions

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